FIG. **11***b* shows a schematic view of a locking mechanism in an apparatus according to an example embodiment of the invention;

FIG. **12** shows a schematic block diagram of an apparatus according to an example embodiment of the invention; and

FIG. **13** shows a flow diagram illustrating a method according to an example embodiment of the invention.

DETAILED DESCRIPTION

Some example embodiments of the present invention and potential advantages are understood by referring to FIGS. **1** through **13** of the drawings. In this document, like reference signs denote like parts or steps.

In an example embodiment there is provided a (hard shell) folding device suitable for accommodating a flexible or bendable display that extends over at least two movable housing parts of the device. In this way it is possible to provide a pocket size device with a relatively large display (for example a 6, 7 or 8 inch display or larger). For transport or storage the display is folded into a hard shell casing for maximal protection.

A bendable display may require a relatively large bending radius. All folding device structures cannot necessarily accommodate a bending display that extends over different folding parts. In an example embodiment there is provided a mechanism configured to retract a bendable display inside a device housing structure as the device folds. In an example embodiment this is achieved with a pivoting connection between the folding housing structure and the display. In this way the bending radius of the bendable display can be accommodated without extensively increasing thickness of the device.

In an example embodiment there is provided a device comprising two device covers or housing parts connected to each other with a hinge. The hinge may be an integral hinge or a separate conventional hinge. A display assembly with a flexible display is fitted into the housing parts. The display assembly comprises frame parts pivotably connected to the housing parts and a flexible display part mounted on the frame parts. As the device is being closed, i.e. as the covers are folded against each other, the frame parts are retracted into the device covers thereby retracting the flexible display inside the device covers and making room for the flexible display to bend.

In an example embodiment there is a device with a rectangular display assembly that comprises pivoting mechanisms on two opposite sides of the rectangular display assembly. The display assembly comprises a flexible bendable display element. The display assembly is configured to be fitted into a rectangular foldable housing structure. When the housing structure is folded into a closed configuration opposite ends of the housing structure are configured to meet each other. These opposite ends of the housing structure comprise pivoting mechanisms configured to mate with the pivoting mechanisms in the display assembly. The pivoting mechanisms in the display assembly and the housing structure connect the display assembly and the housing structure to each other.

It is noted that various example embodiments disclosed herein relate to an embodiment comprising two folding device covers or housing parts, but this is only one example. Also some other foldable housing structure with any suitable number of housing parts is possible. There could be for example three or four housing parts forming the housing structure. Likewise various disclosed example embodiments relate to a hard shell structure, but also this is only one example. In alternative embodiments the cover or housing parts can be at least partially flexible or soft. In an example embodiment there can be a plurality of rigid housing parts providing partially flexible, folding housing structure.

FIG. **1** shows an exploded view of an apparatus **100** according to an example embodiment of the invention. The apparatus **100** is for example a tablet computer, a personal digital assistant, a smartphone, a media player, an e-book reader, a display or a flat-screen television. The apparatus **100** comprises a flexible display part **110**, a metal spring **120** and frame parts **130**. The flexible display is configured to be assembled on the spring **120** and the spring **120** is configured to be assembled on the frame parts **130**. In an example embodiment the frame parts **130** comprise printed wiring board, PWB, and electronics (not shown for the sake of clarity).

In an example embodiment the display part **110** is a touch sensitive display that comprises a touch sensor for detecting the touch of the user on or in proximity thereof. In an example embodiment, the touch sensor comprises a resistive, a surface acoustic wave, a capacitive—such as a surface capacitance, a projected capacitance, a mutual capacitance, or self-capacitance—an infrared, an optical, a dispersive signal and/or acoustic pulse recognition touch sensor or an array thereof.

The display part **110** can be made of plastic, thin glass, thin metal or elastomer for example and, in a further example embodiment, the display part can comprise resilient materials, such as a gel, an elastomer, foam, rubber or silicone or other resilient structures such as hollow, woven, folded or coiled structures, or a folding membrane of e.g. thin polymer of fabric.

In an example embodiment the display part **110**, the metal spring **120** and the frame parts **130** form a display assembly configured to be fitted on a device housing. In other example embodiments a display assembly can comprise other alternative or additional parts.

Further, the apparatus **100** comprises a flexi connector **150**, housing parts **160**, and a hinge **190**. The flexi **150** is for connecting PWBs. The hinge **190** is for foldably connecting the housing parts **160** to each other. In the shown example the hinge **190** is an integral hinge, a so called living hinge. Alternatively, a conventional hinge could be used. Still further the frame parts **130** comprise a pivot hole **140** and the housing parts **160** comprise a pivot axis configured to be fitted into the pivot hole **140** thereby providing a pivotable connection of the frame parts **130** (or the display assembly) to the housing parts **160**. It is to be noted that also some other pivoting structure or connection can be used. Further the housing parts **160** and the frame parts comprise locking or guiding mechanisms **170** and **180**. In an example embodiment the locking mechanisms **170** and **180** comprise balls and holes configured to receive the balls. It is to be noted that also some other locking mechanism can be used. In an example embodiment the locking mechanisms **170** and **180** are configured to lock the frame parts **130** (or the display assembly) into certain different positions in relation to the housing parts **160**. In an example embodiment the locking mechanisms **170**, **180** are configured to lock the frame parts (or the display assembly) to an open position and/or to a closed position. Additionally there may be one or more intermediate locking positions. There may be for example a half open (or partially open) locking position and/or a half closed (or partially closed) locking position.

In an example embodiment the housing parts **160** are hard covers providing mechanical protection to the apparatus **100**. In another example embodiment the housing parts **160**